

45004

Colorado Department of Health

Review and Comment

Technical Memorandum (TM) 5 - Exposure Scenarios
Operable Unit 2, January, 1993

General Comments:

1) The major problem with this TM is the use of fractional intakes and other techniques to "fine-tune" exposure estimates. In general, most of these fine-tuning procedures are not acceptable because they are not consistent with the baseline risk assessment recommendation that RME estimates be used. Thus the proposed methods for calculating intakes will not provide a sufficiently conservative estimate of the extent of risk. Moreover, the Division specifically stated in our review of the first draft of this TM and in the reviews of the baseline risk assessment for OU 1 that the use of fractional intakes was not appropriate and that these factors should not be used. DOE agreed in the baseline risk assessment for OU 1 and should, therefore, carry this over into OU 2.

2) Related to the previous comment, we expect that all procedures within the risk assessment amenable to standardization be made consistent between OUs. This would include such things as exposure scenarios and sub-scenarios considered, receptor intake variable values and calculations, etc. This includes, and should be accomplished for, OU 2.

3) The exposure scenarios presented in this TM consistently avoid inclusion of the more sensitive populations, especially children. Values for the exposure and intake parameters for children must be considered and the methodology for including the parameters should be clearly presented.

Specific Comments:

Section 2.2: The text states that, "more detailed information, such as depths of contamination and the extent of soil removal at the 903 Lip Site, can be found in the Phase II RFI/RI Work Plan". This information should be at least summarized in the Tech Memo and in the PHE.

Section 2.3: Page 2-7. The text states, "Wind flows from the west-southwest approximately 7.2% of the year". This figure differs from that used in the OU1 PHE. Moreover, the wind rose in Figure 2-3 differs from that used in the OU1 PHE for supposedly the same year. Please clarify this discrepancy.

Section 2.5.4: Please cite or include the evidence that "the thin, discontinuous character of these sandstones suggest that a hydraulic connection to the alluvium along Woman Creek is unlikely". The State must be able to independently review and evaluate this data before it can accept this statement as justification for the assumption that wells west of Standley Lake could not become contaminated from groundwater originating in Woman Creek or its sediments. Also, please include or cite the data suggesting that "there are indications that the off-site wells may be hydraulically connected to Standley Lake, a large source of potential recharge".

Section 2.6: Please state how it was determined that, "No vegetative stresses attributable to hazardous waste contamination have been identified". What measurements were taken? What other types of stressors have been identified?

Section 3.0: The reference cited throughout this section of the TM, DOE 1990, uses 1980 census data. Census data for 1990 has been available for some time and should be incorporated in all RFP documents, including this one.

Section 3.1: Again, using a 1989 population projection from 1980 data is not acceptable. In addition, the estimate of zero population growth in the area immediately adjacent to the plant boundary is highly suspect given the change in plant mission.

A map should be provided showing the locations of the schools, hospitals and nursing homes within a 10 mile radius of RFP.

Section 3.2.1: The second sentence on the top of page 3-3 should be changed to read "The northeastern Jefferson County and RFP includes one of the most . . ."

Section 3.2.2: Industrial land-use will probably not "dominate" future land-use in northeastern Jefferson county, particularly given the plant mission change and the pace of residential development in the area.

Reference to Highway W-470 is obsolete since this project is currently defunct.

The second complete paragraph on page 3-4 does not accurately represent the facts. W-470 is no longer an issue, only a small percentage of the area is industrial, zoning does not allow for "heavy" industrial, and the plant's mission has changed.

The third paragraph on page 3-4 uses outdated information from the same report (DOE, 1990) mentioned earlier. Mission change and community perceptions have changed.

The last paragraph in this section is also inaccurate. Current land use in the immediate vicinity of RFP is not primarily commercial/industrial. It is predominantly low density agricultural and residential which can be seen from DOE's inclusion of the land use map and Table 3-2 in this document.

Section 3.3.2: On page 3-6, the text states that occupation by private industry is planned for future use of the on-site production areas. This issue should be revisited in light of potential changes brought about by the new administration and Energy Secretary. Also, there are many inherent problems with private industry using portions of RFP that DOE has been unable to coherently address at this time.

The Rocky Flats Local Impacts Initiative (RFLII) is not "working to achieve" private industry use of RFP. They are evaluating this as one option to minimize economic impacts to the surrounding communities from the changing plant mission.

It is clear that the authors of this section of the text need to receive clarification on these issues from knowledgeable DOE sources. This information should not be coming from the cited sources (Denver Post, Boulder Daily Camera, RFLII).

The first paragraph on page 3-7 states that the buffer zone is being considered as a potential ecological preserve. What the text does not state, but needs to, is that this is only one of several potential uses under consideration. In light of the mission change, many more land use options have become viable.

At the bottom of page 3-7 the text states that extensive development of the area is unlikely. Again, mission change has made this statement less certain.

The last paragraph of this section is entirely wrong for the previously stated reasons.

Section 3.4: Future on-site residential uses are not inconsistent with planned off-site industrial and commercial development. The RFP buffer zone is very large and could easily allow both residential and industrial/commercial land-uses to co-exist. Residential developments are the predominant land-use off-site and are increasingly encroaching on the immediate borders of the buffer zone. The Standley Lake-Louisville-Superior residential area is one of the fastest growing portions of the Denver-Metro area. Water resources are presently not a limiting factor for development and are not anticipated to be in the future. Given the change in

plant mission, future on-site residential developments are no longer "improbable". Whether residential land-use is consistent with outdated DOE plans is no longer relevant.

Section 3.4: The text states "EPA guidance does not require an exhaustive assessment of every potential receptor and exposure scenario". This may be true, however all potential receptors must be identified and compared to determine the likelihood of harm.

Section 3.5.2: Simply because current workers are monitored and protected by current health and safety programs does not mean that current environmental or construction worker scenarios should not be evaluated. In addition, in the Division's comments to the first draft of TM 5, we requested that dermal contact with surface water and sediment and inadvertent ingestion of surface water and sediment be evaluated. DOE still has not included these pathways.

Construction workers are exposed to subsoil. Possible health risks from that media need to be evaluated.

Please clarify the location for the future on-site construction worker receptor. Are IHSSs considered for this exposure scenario?

The future on-site ecological researcher scenario should consider exposure at or within the IHSSs. In a baseline risk assessment, it is inappropriate to assume a future institutional control like a fence. Exposure of this receptor to the IHSSs must be included.

Table 3-1: This table should be updated to reflect 1990 census data.

Table 3-2: Please provide a definition for the zoning code "M-C".

Table 3-4: Current agricultural use occurs off-site and is considered "plausible" in the future. Why hasn't an off-site agricultural family scenario been quantitatively evaluated? Assumptions made under the worker or residential scenarios may not apply to people who live on agricultural property because of differences in length of workday, seasonal changes in work habits, etc. Guidance for exposure parameters to use when considering this scenario are in EPA, 1991 (OSWER Directive 9285.6-03).

Figure 3-1: This figure should be updated to reflect 1990 census data.

Figure 3-3: This map is not readable.

Figure 3-7: The exposure point for future off-site residents should be moved south until it is located on the predominant wind vector emanating from the relatively small area containing the OU 2 IHSSs.

Section 4.2: This section should include a discussion of potential exposures to other media, i.e., airborne soil, direct soil and sediment contact, etc. as well as to ground and surface water.

Section 4.3: Please clarify the receptor locations for the current on-site occupational receptor and the future on-site resident. Also clarify the meaning of "on-site, within the OU2 area" in terms of how the OU 2 data will be interpreted. The Division strongly feels that data sampled from IHSSs must be considered separately. The way DOE presented the data from the IHSSs on OU1 separately from the rest of the OU provides a good picture of the extent of contamination, and this procedure should be used on all OUs for all appropriate receptors.

Section 4.4: Subsurface soil exposures and dermal contact with sediment also should be included in the list of exposure pathways.

Section 4.5.1: The lower hydrostratigraphic unit (LHSU) has not been completely characterized. Nevertheless, some levels of contamination have been found. The Division does not believe it is appropriate to call ground water ingestion and dermal contact with LHSU water an incomplete pathway at this time.

Construction workers in a confined space could conceivably be exposed to VOCs. Moreover, they also could be exposed to high concentrations of outdoor VOCs when freshly uncovering contaminated subsoil. Diffusion in air would likely dilute some of these VOCs, but the amount of dilution would depend upon the concentration of VOCs exposed, the windspeed, the humidity, and a number of other factors. Moreover, depending on these factors, the dilution is not likely to be instantaneous. Therefore, DOE has not convinced the Division that high concentrations of VOCs could not be encountered, and we recommend that exposure of construction workers to outdoor VOCs be quantified.

Section 4.5.2.1: The Division must be able to review and independently evaluate the offsite sediment sampling data that indicates that incidental ingestion of, and dermal contact with, offsite sediments would be incomplete pathways.

The Division does not agree with the statement that, "the primary radionuclides of concern at the RFP, plutonium and americium, do not have highly penetrating radiation associated with them". These two radionuclides emit not only alpha particles, but also emit beta and gamma radiation. The Division also cannot agree *a priori* that "external irradiation exposures to offsite residents resulting from deposition of radionuclides via airborne particles are expected to be an incomplete pathway since relatively low concentrations of radionuclides in offsite residential soils due to fugitive dust deposition are expected". The surface soil sampling data that shows this must be reviewed first.

The State does not consider the rationale presented by DOE for only evaluating surface deposition of particulates on plants potentially consumed by offsite residents to be valid. The uptake by fruits and vegetables of contaminants from soil must be considered as well.

- The fact that "metals bind tightly to soil, thus greatly reducing their bioavailability to plants" is true. However, it is well known that a wide variety of plants can concentrate metals, even against concentration gradients. Plant uptake of metals from soil can be an active as well as a passive process. Moreover, metal bioavailability from soils to plants is a highly site-specific process. This rationale is not a valid reason for considering plant uptake of contaminants deposited as windblown particulates on soil as an incomplete pathway, and as such is unacceptable.

- Tilling may indeed dilute surface contaminant concentrations. However, dilution does not necessarily make the pathway incomplete. Such considerations as the toxicity of the contaminant and the initial surface concentration must be evaluated.

- Simply because the relative importance of a pathway is less than others does not mean that the pathway necessarily should be eliminated from consideration in the baseline risk assessment. The point is to determine the extent of possible contamination. Potential current effects on offsite residents should be characterized as completely as possible.

Section 4.5.2.2: In addition to those potential exposure routes listed, the future construction worker scenario also should include stormwater runoff (exposure to sediments in construction sites) and infiltration and percolation (exposure to shallow groundwater in construction sites). As mentioned previously, exposure to outdoor VOCs should be included under volatilization. Figure 4-1, the Conceptual Site Model should be corrected to show these additions.

As mentioned before, because current workers are monitored by a strict Health and Safety Program, does not release DOE from evaluating a given pathway.

Section 4.5.2.3: The discussion of future onsite office workers and construction workers should be separated so that it is clear which potential chemical release mechanisms apply to which receptor.

Also, the Division contends that future construction workers will not work only in the industrial complex. Therefore, direct contact with surface water as well as to UHSU groundwater discharged into surface water entirely plausible, and exposures to these pathways must be evaluated.

Both the text and Figure 4-1 indicate that direct contact with soils represents significant exposures for office workers and insignificant exposures for construction workers. This is mixed up, and should be corrected.

Section 4.5.2.4: It is entirely plausible that environmental research and clean-up companies might work at RFP in the event that some of the decontaminated buildings become commercial. In that case, it would be possible for future environmental researchers to work indoors onsite and be exposed to indoor VOCs.

Section 4.5.2.5: Fruit consumption as well as vegetable consumption must be considered for all appropriate receptors.

Figure 4-1: Oral and dermal exposures to surface water and sediment for the current on-site worker should be changed from "N" to "I".

In addition, dermal contact to LHSU ground water should be added to the figure and an "I" should appear for future on-site residents. The remaining receptors to this pathway would be "N".

Section 5.0: In the second paragraph, ground water and sediments should also be included in this list.

As we stated in our previous review of the draft TM 5, the Division insists that exposures to children and to adults for all appropriate media be evaluated separately. The Division does not agree with the statement in the text that "body weight is not exactly proportional to surface area and age-specific body weight/inhalation rates differ by factors of two or less." Children often are the most sensitive populations to a given toxic effect. Inhalation rate is inversely related to body weight, and total deposition of air particles in the respiratory tract for children is higher than it is for adults (Xu and Yu, Aerosol Science and Technology 5: 349-357, 1986). Therefore, DOE must quantitatively estimate child residential exposures for all exposure pathways, not just for soil ingestion.

Section 5.1.1: The Division is uncomfortable with the use of 60 days of snowcover because inhalation of particulates is not necessarily limited to days when there is no snow. Dirt and mud can be tracked indoors even on snowy days, and ingested or inhaled. However, if DOE limits their use of some of the other techniques they have proposed to "fine-tune" the RME estimates of contact times, we would be willing to accept the decrease from 350 days to 290 days because of snowcover. Note that the use of 60 days of snowcover does not give an RME estimate, and as such, DOE is likely to underestimate exposures and risks.

Section 5.1.2: A conservative respiratory rate for construction workers would be 1.4 m³/day as used for the landfill workers in OU 7. This would be a more appropriate rate than the standard RME value of 0.83 m³/day.

The most sensitive populations (invalids, young children, retired people) spend the majority of their time at home. Therefore, it is

not appropriate to use a 16 hour exposure time instead of a 24 exposure time.

In order to protect the susceptible populations, the Division again recommends that the exposure times (ET) for residents be changed to 24 hours/day and that the fraction contacted (FC) (if it is used) be changed to 1.0 from 0.5.

The state does not agree with the use of a lung deposition factor for an RME estimate. Moreover, while the statement that "25% of inhaled particles are deposited in the lungs" is true per se, deposition can also occur in other parts of the respiratory system where it can exert health effects. The same table in the same study (EPA, 1985) that listed the 25% lung deposition also states that 50% of inhaled particles are deposited in the upper respiratory passages and subsequently swallowed. These chemicals are thus retained in the body and could be absorbed and exert toxic effects. Baseline risk assessments are concerned with overall health effects, and not simply lung effects. Therefore, if used at all, the usual value for depositional fraction is 75%.

Section 5.1.3: A value of 50 mg/day of soil in the RME case for most occupational receptors is acceptable. However, OSWER Directive 9285.6-03 suggests that a value of 480 mg/day of soil be used for outdoor activities like construction and landscaping.

Fraction Ingested (FI) factors should not be used. The calculation for the future on-site ecological researcher is based area, not time, and is, therefore, unacceptable. Depending upon the research project, it is entirely conceivable that an ecological researcher could spend the vast majority of time in one area like OU 2 or a small portion (including the IHSSs) of OU 2. Averaging the exposure over the whole RFP buffer zone will dilute any exposure. The result is that DOE's proposed method is not protective in the remotest sense. In addition, RAGS (6.6.2) suggests that concentrations in indoor dust can be equal to outdoor dust. Therefore, FI should be equal to 1.0, not 0.5, for the residential exposure scenario.

Soil matrix factors should not be used to modify soil ingestion exposures. The usefulness of soil matrix values and the availability of appropriate site-specific and chemical-specific values in the literature is questioned.

Section 5.1.4: The discussion of matrix effect on produce bioavailability is unclear. What kind of matrix values is DOE proposing to use? Chemical-specific values are only rarely available.

Section 5.1.5: A future ecological researcher is likely to be exposed to surface water and sediment many more times than 7/year. 7 events/year is unacceptable for this receptor. The OU 1 PHE used

1 day/week.

Section 5.1.6: The RME value of 2910 cm²/day for exposed body surface area is inappropriate for residential receptors. Residential receptors are likely to expose more than just the face, forearms and hands. Moreover, the reference cited is not the latest guidance. While 2910 cm²/day would be OK for most occupational receptors, EPA 1992, "Dermal Exposure Assessment: Principles and Applications" notes that clothing is not fully protective against exposure to many chemicals. Thus, a higher surface area value should be used.

The current RME soil adherence value is not 0.5 mg/cm². EPA 1992, "Dermal Exposure Assessment: Principles and Applications" recommends a range, 0.2 mg/cm²-1.5 mg/cm² per event. A value of 0.9 mg/cm² was used in the OU1 PHE. Values such as this should be standardized for all RF health evaluations.

The Division reiterates our disagreement with the fraction contacted (FC) values presented for the future on-site ecological worker and the current and future residential receptors. Depending upon the research project, it is entirely conceivable that an ecological researcher could spend the vast majority of time in one area like OU 2 or a small portion (including the IHSSs) of OU 2. In order to protect the susceptible populations, the Division recommends that the fraction contacted (FC) (if it is used) be changed to 1.0 from 0.5 for future and current residential receptors.

Section 5.1.7: It is unclear from this discussion whether actual sediment concentrations of metals or chemicals are going to be factored into the surface water model. What is "a suspended sediment factor"?

A researcher is likely to be exposed to surface water for more than 7 events/year. This value is not acceptable.

Table 5-1: How are children factored in to the 0.83 m³/hr inhalation rate?

Tables 5-9, 5-10, and 5-11: The combination of an EF of 30 days/yr and ED of 1.0 years for a future on-site construction worker is not reasonable. A future on-site construction worker could be involved in home building, road construction, utility construction and maintenance, office or industrial construction, etc. Most of these activities, if confined to one calendar year, would last more than 30 days. Conversely, if they only last 30 days, they would probably be repetitive and cover more than one calendar year. Either one or both of these factors should be increased to a more reasonable value.